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Technical Report

AD 640 115

MECHANIZATION STUDY OF THE RECON CENTRAL, RECONNAISSANCE DIVISION, AIR FORCE AVIONICS LAB., WRIGHT-PATTERSON AFB, OHIO

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Technical Report

AD 640 115

MECHANIZATION STUDY OF THE RECON CENTRAL, RECONNAISSANCE DIVISION, AIR FORCE AVIONICS LAB., WRIGHT-PATTERSON AFB, OHIO

BOOZ · ALLEN APPLIED RESEARCH INC.

ABSTRACT

Information storage and retrieval functions at the Recon Central are partially mechanized by a system composed of "peek-a-boo" coordinate index cards, a Flexowriter automatic typewriter with an EAM punched card reader input and an automatic "peek-a-boo" card reader, and various types of copying devices. The stored information is primarily in document abstract form on microfilm chips that are on unpunched aperture cards. The system produces for a search requester lists of retrieved abstract accession numbers with corresponding document titles, and, if desired, enlarged copies of the selected microfilm chips. Recon Central estimates that cost investment in this semiautomated system is about one-tenth that of a fully computerized system giving the same performance in their application of it.

TABLE OF CONTENTS

A P P E N D I C E S

INDEX OF FIGURES

I. SUMMARY

The information storage and retrieval functions in the Recon Central are partially mechanized by a system composed of "peek-a-boo" coordinate index cards (McBee Keydex), a Flexowriter automatic typewriter with an EAM punched card reader input and an automatic "peek-a-boo" card reader, and various types of copying devices. (Peek-a-boo cards have holes drilled to represent documents possessing a particular term.) The stored information is primarily in document abstract form on microfilm chips that are on unpunched aperture cards. The system produces for a search requester lists of retrieved abstract accession numbers with corresponding document titles, and, if desired, enlarged copies of the selected microfilm chips.

The primary mission of the Recon Central is to serve the needs of the Reconnaissance Division of the Air Force Avionics Laboratory by providing a data storage, retrieval, and reproduction facility in the field of reconnaissance and surveillance technology. Appendix A illustrates the organizational relationship of the Recon Central within the Laboratory. Besides individual requests for information, the Central provides the reference source for a team of scientists and engineers in the Reconnaissance Division who produce state-of-the-art summaries, technical reports, and other publications for the

reconnaissance community, as well as recommendations for research and development efforts in selected areas. Recon Central's services are also available to other DoD activities, contractors, and other authorized users. (Contractors may only request and receive the services through their contract monitors.)

The Central's collection presently consists of about 16,000 items. Of these, 8,000 are microfilm images of document abstracts. The remainder are technical reports and programs and requirements data. There are about 3,000 classified items in this collection. The rate of growth of the collection is estimated to be about 4,000 items per year, including about 3,000 abstracts. These items originate with Foreign Technology Division (FTD), Defense Documentation Center (DDC), and National Aeronautics and Space Administration (NASA).

The Recon Central has recently promulgated to U.S. Air Force users its Keyword Book (AD 452118), which is a listing of about 8,000 descriptors used in indexing its collection. This listing includes descriptors used in the FTD Clue Word system, the NASA Index, and the DDC descriptor systems.

II. MECHANIZATION

1. CHRONOLOGY

In 1958, applications of various coordinate indexing systems to information retrieval systems were investigated. A system was recommended to management, but no action was taken.

In 1961, the Reconnaissance Applications Branch was formed, and money was made available to explore methods of information retrieval. A study was performed by contract. The contractor recommended the McBee Keydex system, which is a peek-a-boo card coordinate index system, and peripheral equipment including an automatic peek-a-boo card reader and an EAM card reader which would operate a Programmatic Flexowriter. Staff members, including several physicists, visited DDC and assembled the original collection consisting of 8,000 DDC abstracts. The contractor then began furnishing these items in system format. Another contractor was given the task of operating the retrieval system within the Applications Branch facility. The aperture card was selected as the storage media because of the variety of sizes of abstract cards.

In 1964, the document Recon Central--A Concept in Action was promulgated to U. S. Air Force elements to describe the facility and its operation.

In 1965, the contracts for system development and operation were combined, and one contractor was selected to perform the functions.

2. DESCRIPTION OF PROCESSES

In the Keydex system, one keyword is assigned and printed on each term card. Holes are drilled in each card denoting, by hole coordinates, each document number that carries the index term. The number is determined by using a grid overlay and reading the 100's position on the y-axis and the units position on the x-axis.

Holes are drilled in the cards with a mounted precision drill which is movable on two axes to the appropriate coordinates. The coordinates are determined by a scale on each of the two axes and may be checked with a 100 x 100 grid overlay. Item number 427, for example, would correspond to the 04th row and the 27th column. Thus, positions are available on a term card for 10,000 holes, and this represents the capacity of each complete set of cards.

To search the system, the Recon Central operator selects term cards corresponding to the user's desired keywords and superimposes them all together over a card-sized light source. Holes with

light shining through represent coincident holes and therefore coincident terms. Coordinates of the lighted holes are the applicable document numbers. Assume, for example, that a search is to be made for a photographic reconnaissance radar equipment which is used for obtaining target signatures. Three keyword term cards are necessary for this search: "Radar", "Photographic", and "Signature". The "Radar" card contains holes for the accession numbers of all of the items containing information about radar. By overlapping the three cards over the light source, light will shine through only those locations that identify documents having all three keywords. Two to three minutes are said to represent a typical time for conducting a search.

Figure 1 is a flow diagram of the system input procedures. Figure 2 illustrates the search and retrieval process.

(1) Information Input Procedures

1. Recon Central receives about 100 items per day, consisting mostly of document abstracts from DDC, NASA, Atomic Energy Commission(AEC), and other agencies, and from documents produced in the Division. A sample abstract is shown in Appendix B-1.

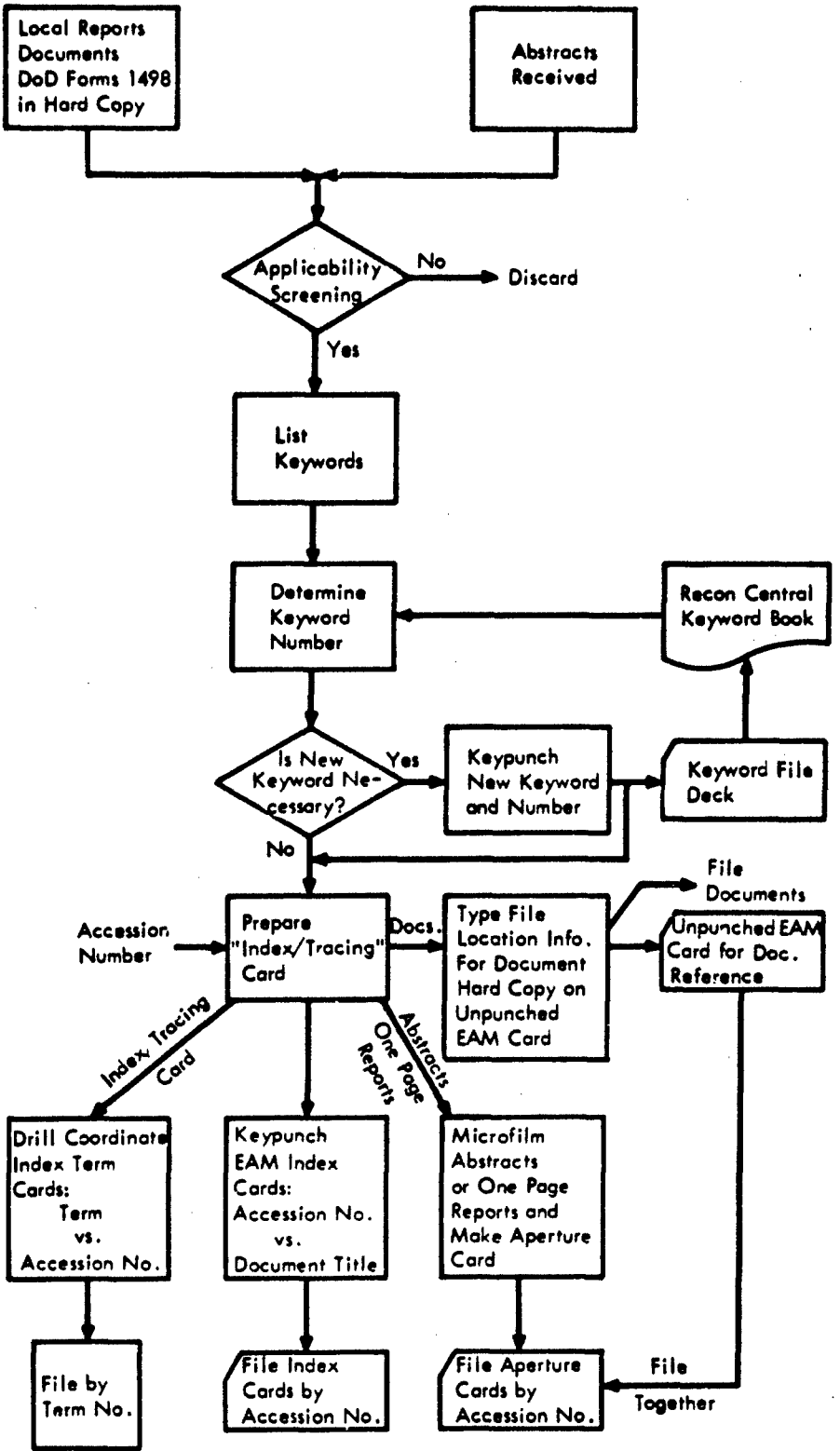


FIGURE 1
McBee Keydex System Input Procedures

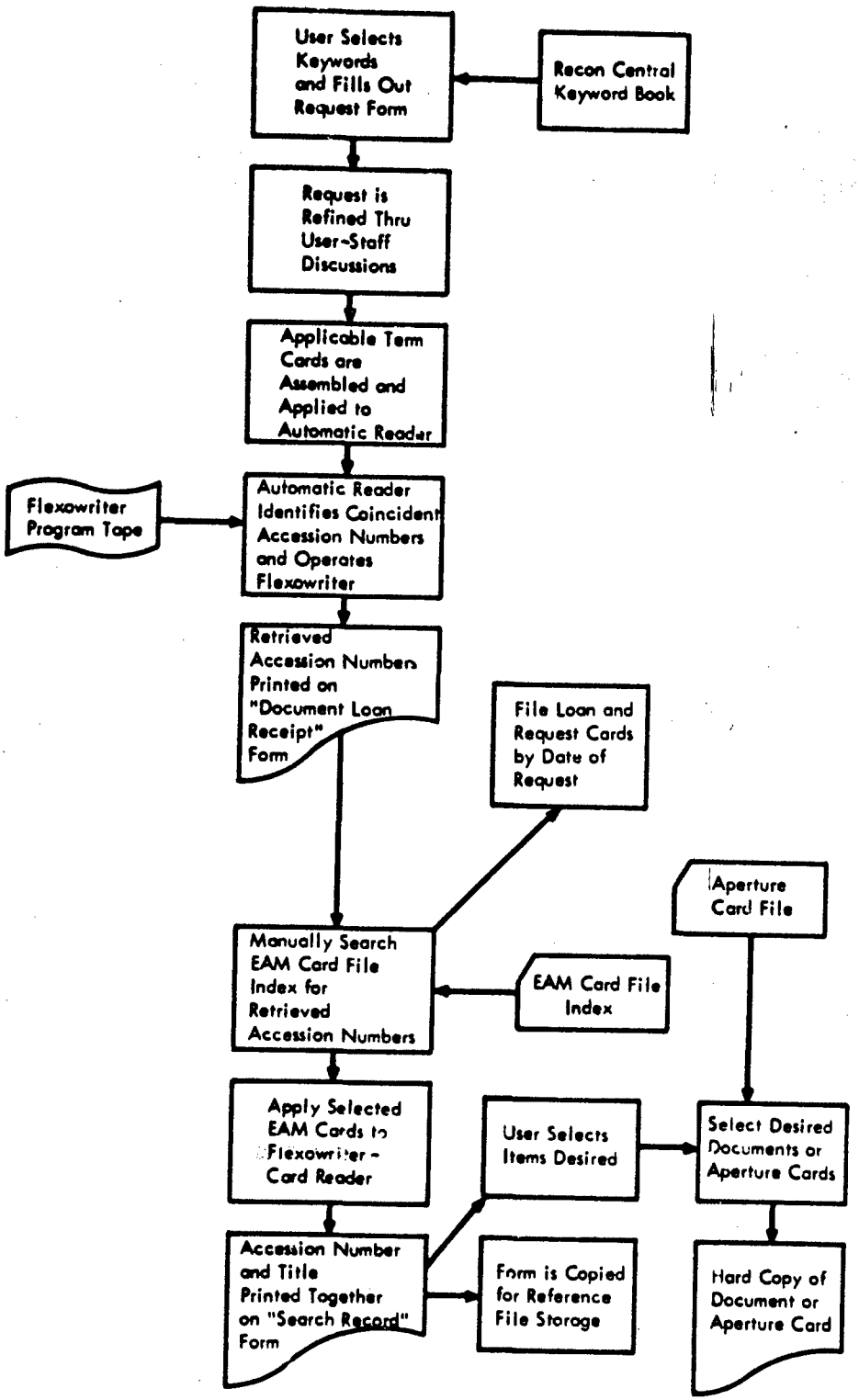


FIGURE 2
Search and Retrieval Process

2. Items are scanned for pertinency to the subject matter of the collection. Those not pertinent are discarded.

3. Items selected for inclusion in the system are assigned accession numbers.

4. Keywords describing each item are listed.

5. Keywords are coded by number, using the Keyword Book. (Appendix B-2 illustrates a page extracted from the Keyword Book.) If a keyword chosen does not appear in the Keyword Book, a decision is made as to whether to add it to the list. If the decision is affirmative, an EAM card is punched for the new keyword and its code number to be added to the Keyword Book. Presently, there are about 3,400 keywords and 6,000 combinations. Four-digit code numbers are used, giving a capacity of 10,000 keywords.

6. An Index/Tracing Card is prepared as in the sample shown in Appendix B-3. This lists the accession number, the title, and the keywords with the corresponding code numbers for the item. It also shows a location number in the case of a full-length document. The

average number of keywords assigned to an item is 12.

7. Peek-a-boo coordinate index cards are drilled for the accession numbers of the items.

8. Peek-a-boo cards are filed by subject term (keyword) number.

9. An EAM index card is keypunched for document accession number and title. This card is filed by accession number.

10. If a full-length document is being entered in the system, the location of the document is noted on an unpunched EAM card which is then filed by accession number with the abstract aperture cards.

11. If the item is an abstract or a page report, it is microfilmed on an aperture card. The aperture card is filed by accession number in the same file with the cards for full-length documents. A sample aperture card is shown in Appendix B-4.

(2) Information Retrieval Procedures

1. The user selects the keyword codes for the subject

he wishes searched and enters them on a Document Request Card as shown in Appendix C-1. He may receive the assistance of the Recon Central staff in choosing applicable keywords.

2. The peek-a-boo cards that have the applicable terms are manually extracted from the file and applied to the automatic reader.

3. The reader identifies the pertinent accession numbers and activates the Flexowriter.

4. The Flexowriter prints out the accession numbers on a Document Loan Receipt Form, shown in Appendix C-2.

5. If the number of accessions retrieved is small, the file is manually searched for the corresponding EAM title cards. (An example of a title card is shown in Appendix C-3.)

These cards are applied to the Flexowriter Card Reader, which prints out the accession numbers and titles together as a Document Search Record form (see Appendix C-4). The user selects the items he desires from this list. If the item is on an aperture card, he may

view it on a microfilm reader and have an enlarged print of it made for his personal use. (Classified items are reproduced with a special format which is incorporated into the aperture card.) If the item is a document, the user may check it out of the collection.

6. Used cards and documents are refiled manually.

III. EQUIPMENT, COSTS, AND EVALUATION

1. EQUIPMENT

Royal McBee Keydex System

Retrieval of item accession numbers from the information data base is accomplished with the aid of the Keydex System, a manual, random access, coordinate index based on peek-a-boo term cards. The Keydex equipment at Recon Central consists of two sets of flexible plastic term cards provided with tabs and edge notches for filing. Two tab files contain the card sets.

Automatic Keydex Card Reader

This device, which was specially designed for the Recon Central by Technology Inc., searches for lighted holes resulting from the overlay of Keydex term cards and automatically transmits the coordinates of these holes to a Flexowriter. The entire card of 10,000 coordinate numbers is searched in 20 seconds, plus 6 seconds for each accession number printout. The average search and printout runs 1-2 minutes.

Friden Programmatic Flexowriter

The Flexowriter in the Central is programmed to print out accession numbers received in electrical signal form from the Automatic Keydex Card Reader. To establish the desired print-out format, the program tape is arranged in a continuous loop which instructs the machine to type up to ten rows of nine six-digit numbers on a card, each number separated by two spaces. Each row of nine numbers is followed by a carriage return.

EAM Card Reader

This device reads the EAM title cards and signals the Flexowriter to print the card-coded accession number and full title.

Recordak Magna Printer

This equipment reproduces on 8-1/2 x 11 paper an enlarged image of the abstract from the selected aperture card microfilm chip.

3M Filmac 200 Thermofax Reader/Printer

The film chips of aperture cards are copied by this machine on 15 x 30 paper.

Aperture Card Viewer

Retrieved aperture cards may be viewed in these devices.

Ozalid Ozamatic 60

This is a copier which accepts translucent masters and reproduces them in the same size on a variety of materials. A common application is the production of heavy-gauge report covers, visual aids, and any other special reproduction needed in the preparation of flash reports.

3M Filmsort "Uniprinter 08C"

This copier is used to produce duplicate aperture cards.

3M Photo-Copier 209

Copies of retrieved accession numbers with titles on the search record form are made with this machine for record storage. The 3M Photo-Copier 209 is also used for the reproduction of selected pages of hard-copy reports stored in the Recon Central -- that is, when a user wants a permanent copy of certain pages in a retrieved report.

2. COSTS

Friden Programmatic Flexowriter Automatic Keydex Card Reader EAM Card Reader	$20,000
Keydex System	$ 2,000
Miscellaneous copiers and viewers	$ 7,500
Estimated processing cost	$2 to $3 per document

(This refers to the acquisition, coding, and storage of the selected documents. Title printouts average $1 per search. Reproduction of hard copy, as required, averages $.10 to $.20 per item.)

3. FACILITY'S EVALUATION OF SYSTEM

Investment in Recon Central's system of semiautomatic equipment is estimated to be about one-tenth that of a fully computerized system giving the same performance in the handling of abstracts and reports. The main advantages of a computer would be faster retrieval, more sophisticated manipulation of search procedures, and, most important, automatic summary report preparation in preselected formats.

The system as presently constructed meets the main requirement of getting the information desired into the hands of the user in time to be useful, i.e., in less than one week.

Since the main data source in the Central is document abstracts, the file is only as current as the abstract supply, which may be as much as five months behind. Use of a form (1498) in the system for summarizing on-going projects with reconnaissance applications reduces the delay in acquiring information on new developments.

A search is considered successful if the user desires 30-40 per cent of the retrieved items. A larger percentage is considered to result from too narrow a search which does not permit the user to browse or to expand his ideas.

The Recon Central is presently examining the usefulness of performing these search and retrieval functions using the IBM 360 computer. This is being done through a study contract. The availability of machine-readable abstract cards (e.g., from DDC) would considerably improve the practicability of using computer techniques. Besides relieving the clerical work load, the Central feels that the computer capability of "massaging" the data would be very valuable. Also, use of the 360 would permit the establishment of remote terminals for real-time query of the Central's data base.

The Central feels that a direct TWX tie-in to DDC would be very useful in improving response-to-query time.

Use of the Keydex System, while adequate, requires a considerable amount of clerical attention in drilling cards, locating the cards needed for a search, etc. For this reason the Central is considering the newly announced Access System which can select edge-notch-coded cards from a random file. The Access System has a theoretically unlimited capacity for cards and has a variety of coding arrangements for maximum flexibility in retrieval.

The use of keywords as presently configured is limited by a lack of selectivity. The Recon Central is currently considering a hierarchical configuration to reduce this problem.

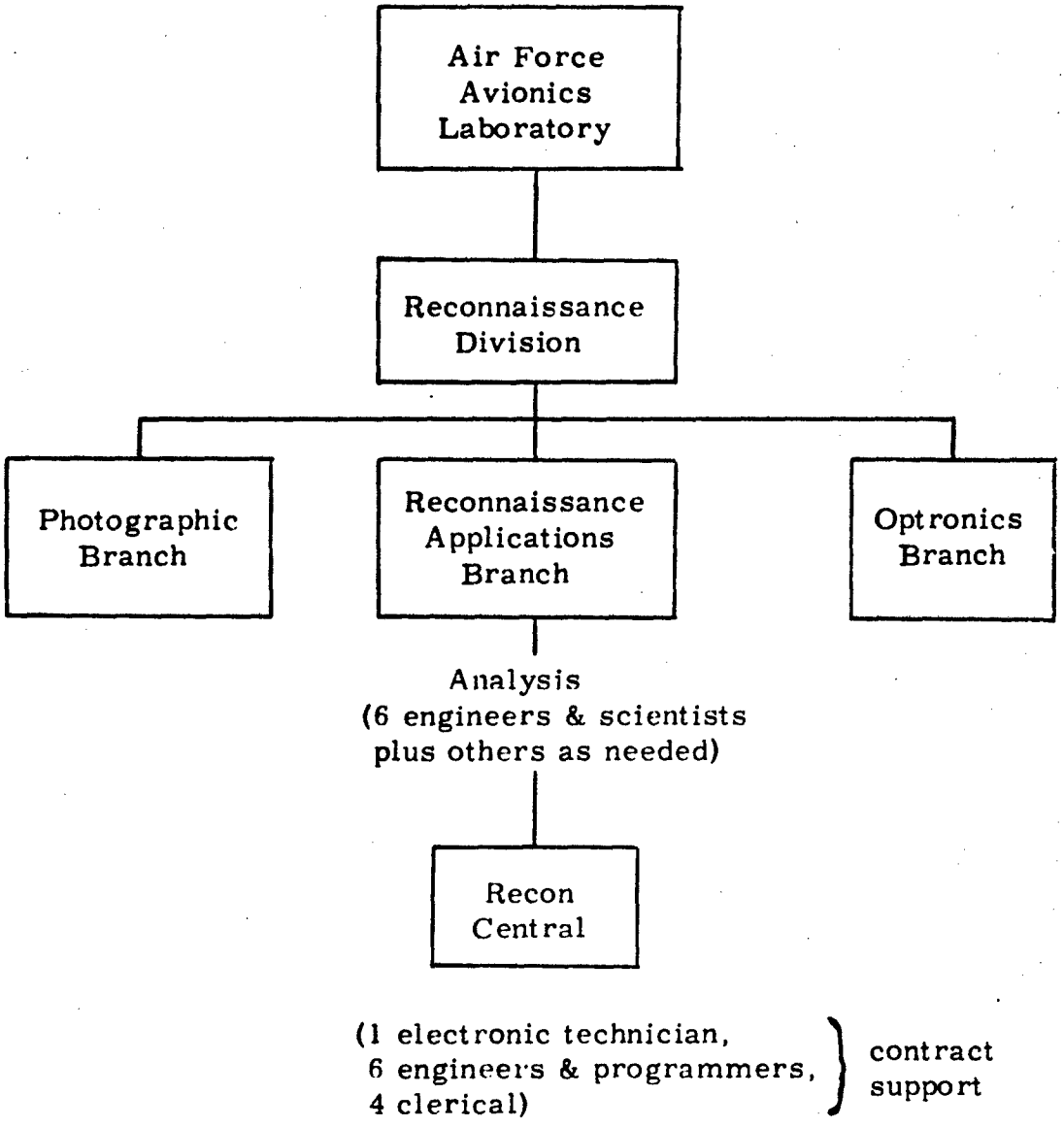
The use of aperture cards has greatly eased the storage problem since original abstracts, reports, etc. come in various sizes.

B I B L I O G R A P H Y

Areas of Interest, an Air Force Avionics Laboratory Publication, AFAL Report 448-50-1096, Air Force Avionics Laboratory, Wright-Patterson Air Force Base, Ohio, June 1965.

Recon Central- A Concept in Action, an Air Force Avionics Laboratory Publication, AD 452119, Air Force Avionics Laboratory, Wright-Patterson Air Force Base, Ohio, revised 1 August 1965.

The Recon Central Keyword Book, report published by Technology Incorporated under contract AF 33(657)-11676, AD 452118.


Air Force Avionics Laboratory
Reconnaissance Division
Photographic Branch
Reconnaissance Applications Branch
Optronics Branch
Analysis
(6 engineers & scientists plus others as needed)
Recon Central
(1 electronic technician, 6 engineers & programmers, 4 clerical)
contract support

B-1 Document Abstract Sample

28 APR 65 **UNCLASSIFIED** RC 123123

—RECON CENTRAL— TECHNICAL DATA SHEET

AD-226 689 Div 2, 24
(Oct 59)

Army Engineering Research and Development Labs., Fort Belvoir, Va.
EQUIPMENT AND TECHNIQUES FOR THE UTILIZATION OF CONVERGENT PHOTOGRAPHY IN MAPPING, by Joseph P. Rustron. 28 Aug 59, 50p. incl. illus. tables, 15 refs (Rept. no. 1583-TR)
Unclassified report

The development of equipment and techniques for convergent photography in mapping are summarized. A camera installation is described that consists of two 6-in. focal length precision mapping cameras tilted about 20° from the vertical, fore and aft respectively, in the line of flight. The benefits and disadvantages of convergent photography are compared with those of vertical photography. Results indicate that (1) convergent photography has a higher vertical accuracy potential and about the same horizontal accuracy as vertical photography, and (2) convergent (over)

UNCLASSIFIED

Rustron, Joseph P

RETRIEVAL TERMS

Mapping*
Aerial photography
Instrumentation
Aerial cameras*
Flight tests

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UNCLASSIFIED

photography is suitable for base-plant operations and should be fully exploited at the Army Map Service, especially during peacetime. (Author)

SAMPLE

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B-2 Keyword Book Sample

KEYCODE	KEYWORD
	WIRE, EXPLODING USE INDIVIDUAL DESCRIPTORS
3115	WIRING
3116	WORK
	WORK, EXPERIMENTAL USE INDIVIDUAL DESCRIPTORS
	WORK, PRESS OFFSET USE INDIVIDUAL DESCRIPTORS
3119	X-BAND
3142	X-RADIATION
3120	X-RAY
	X-RAY DIFFRACTION ANALYSIS USE INDIVIDUAL DESCRIPTORS
	X-RAY DIFFRACTION CAMERA USE INDIVIDUAL DESCRIPTORS
	X-RAY FILTER USE INDIVIDUAL DESCRIPTORS
	X-RAY OPTICAL ANALYSIS USE INDIVIDUAL DESCRIPTORS
	X-RAY PHOTOGRAPHY USE INDIVIDUAL DESCRIPTORS
	X-RAY SPECTROSCOPY USE INDIVIDUAL DESCRIPTORS
3121	X-15 AIRCRAFT
3118	X-15A AIRCRAFT
3117	XA-1
3122	XENON
	XENON LAMP USE INDIVIDUAL DESCRIPTORS
3231	XEROGRAPHIC
3123	XEROGRAPHY
	XEROGRAPHY, CONTINUOUS TONE USE INDIVIDUAL DESCRIPTORS
3124	YAW
3125	ZEEMAN
	ZEEMAN EFFECT USE INDIVIDUAL DESCRIPTORS
3126	ZEHNDER
3127	ZENITH
3128	ZINC
3129	ZODIACAL
3130	ZONE
	ZONE, FRESNEL USE INDIVIDUAL DESCRIPTORS
2887	ZOOM
2676	70MM

DOCUMENT NUMBER

ITE	INDEXED BY	EDITED BY	PAGE OF CEN	DOCUMENT NO. RAL 120000

DCUMENT TITLE

CADMIUM TELLURIDE

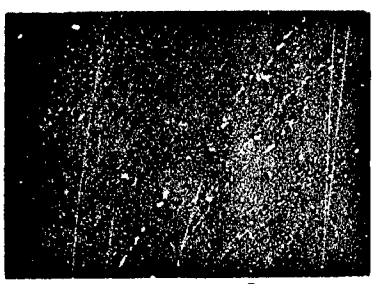
LOCATION AD 320 273

KEY CODE	KEY WORD OR CHARACTERISTIC	SCOPE NOTES
0295	CADMIUM	(O) 0599 (CRYSTAL)
0974	COMPOUND	1723 (METALLIC)
2864	TELLURIDE	
2232	SEMICONDUCTOR	
(O)	CRYSTAL METALLIC	
1154	INFRARED	
2619	DETECTOR	

EYCEX-H 1962 ROYAL McBEE FORM KE-1130 PRINTED IN U.S.A.

INDEX TRACING CARD

RECUN CENTRAL 123123



Filmsort CAMERA CARD
FROM THE "FILMSORT 1000d" PROCESSOR—CAMERA

MMM 1483 "FILMSORT" BRAND APERTURE CARD PRODUCT OF 3M CO. ST. PAUL 6, MINNESOTA U.S. PAT. NOS. 2,512,106; 2,587,022

B-4 Sample Aperture Card

C-1

DOCUMENT REQUEST CARD
RECON CENTRAL

REQUEST THE DOCUMENTS ASSOCIATED WITH THE KEYWORD CODES LISTE BELOW. (FOR COMBINATIONS OF CODES, INDICATE BY PARENTHESES AROUN THE GROUP TO BE INDEXED SIMULTANEOUSLY.)

DATE SIGNATURE ORG. SYMBOL

KEYWORD CODES--

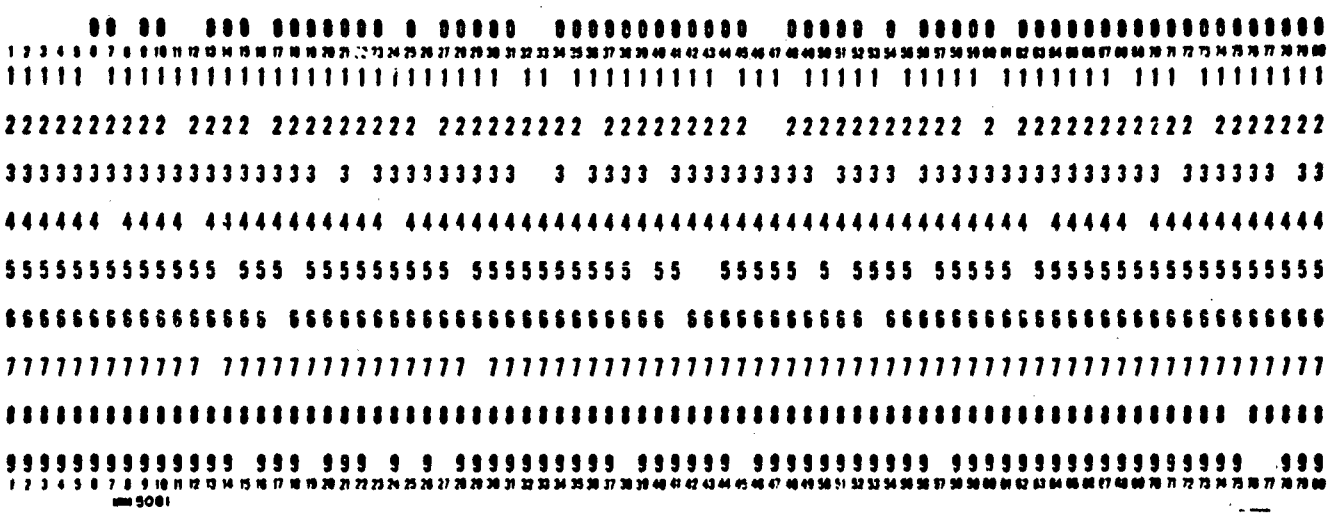
DOCUMENT LOAN RECEIPT
RECON CENTRAL

I HEREBY ACKNOWLEDGE RECEIPT OF RECON CENTRAL DOCUMENTS OF THE ACCESSION NUMBERS INDICATED BELOW. THIS CARD SHALL BE RETURNED TO ME WHEN I RETURN THE DOCUMENTS. IT IS UNDERSTOOD THAT I WILL NOT REMOVE THE DOCUMENTS FROM THE TECHNICAL REFERENCE ROOM WITHOUT PERMISSION.

DATE SIGNATURE ORG. SYMBOL

DOCUMENT NUMBERS--

C-3
EAM Title Card



RECON CENTRAL

DOCUMENT SEARCH RECORD

DATE:

/ORD(S) USED

REQUESTER:

)TE: The documents indicated below have been identified by the coordinate index system of Recon Central. The number ted in the right hand column is the accession number assigned to the document by the data center (DDC, NASA, etc.) from the abstract was obtained. Full copies of the technical article can be obtained by direct communication with that center. iumber appears in the right hand column, it means that the original document is stored within the Recon Central or within the classified data centers of FTD.

t.	TITLE	SOURCE NR.
	[illegible]	
	[illegible]	AD 297 61
	[illegible]	AD 40 47
	[illegible]	[illegible]
	[illegible]	[illegible]

...NFAR. VOLUME I

Unclassified

Security Classification

DOCUMENT CONTROL DATA - R&D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1 ORIGINATING ACTIVITY (Corporate author) BOOZ · ALLEN APPLIED RESEARCH, INC. 4733 Bethesda Avenue Bethesda, Maryland 20014	2a REPORT SECURITY CLASSIFICATION Unclassified 2b GROUP

3 REPORT TITLE

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4 DESCRIPTIVE NOTES (Type of report and inclusive dates)

Final Report of on-site survey

5 AUTHORS (Last name, first name, initial)

G. A. Kershaw, D. Crowder, J. E. Davis, E. G. Loges, E. Merendini, S. M. Thomas

6 REPORT DATE	7a TOTAL NO. OF PAGES	7b NO. OF REFS
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8b PROJECT NO	9b OTHER REPORT NO(S) (Any other numbers that may be assigned this report)
c	AD 640 115
d	

10 AVAILABILITY LIMITATION NOTICES

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None	Defense Supply Agency Defense Documentation Center Cameron Station, Virginia

13 ABSTRACT

Information storage and retrieval functions at the Recon Central are partially mechanized by a system composed of "peek-a-boo" coordinate index cards, a Flexowriter automatic typewriter with an EAM punched card reader input and an automatic "peek-a-boo" card reader, and various types of copying devices. The stored information is primarily in document abstract form on microfilm chips that are on unpunched aperture cards. The system produces for a search requester lists of retrieved abstract accession numbers with corresponding document titles, and, if desired, enlarged copies of the selected microfilm chips. Recon Central estimates that cost of investment in this semiautomated system is about one-tenth that of a fully computerized system giving the same performance in their application.

DD FORM 1473

Unclassified

Security Classification

Security Classification

KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Data Documentation Electronic Accounting Machines Information Retrieval						

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6. REPORT DATE: Enter the date of the report as day, month, year, or month, year. If more than one date appears on the report, use date of publication.

7a. TOTAL NUMBER OF PAGES: The total page count should follow normal pagination procedures, i.e., enter the number of pages containing information.

7b. NUMBER OF REFERENCES: Enter the total number of references cited in the report.

8a. CONTRACT OR GRANT NUMBER: If appropriate, enter the applicable number of the contract or grant under which the report was written.

8b, 8c, & 8d. PROJECT NUMBER: Enter the appropriate military department identification, such as project number, subproject number, system numbers, task number, etc.

9a. ORIGINATOR'S REPORT NUMBER(S): Enter the official report number by which the document will be identified and controlled by the originating activity. This number must be unique to this report.

9b. OTHER REPORT NUMBER(S): If the report has been assigned any other report numbers (either by the originator or by the sponsor), also enter this number(s).

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."

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."

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."

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11. SUPPLEMENTARY NOTES: Use for additional explanatory notes.

12. SPONSORING MILITARY ACTIVITY: Enter the name of the departmental project office or laboratory sponsoring (paying for) the research and development. Include address.

13. ABSTRACT: Enter an abstract giving a brief and factual summary of the document indicative of the report, even though it may also appear elsewhere in the body of the technical report. If additional space is required, a continuation sheet shall be attached.

It is highly desirable that the abstract of classified reports be unclassified. Each paragraph of the abstract shall end with an indication of the military security classification of the information in the paragraph, represented as (TS), (S), (C), or (U).

There is no limitation on the length of the abstract. However, the suggested length is from 150 to 225 words.

14. KEY WORDS: Key words are technically meaningful terms or short phrases that characterize a report and may be used as index entries for cataloging the report. Key words must be selected so that no security classification is required. Identifiers, such as equipment model designation, trade name, military project code name, geographic location, may be used as key words but will be followed by an indication of technical context. The assignment of links, roles, and weights is optional.

Security Classification